

III.—*List of the Mollusca brought back by Dr. J. ANDERSON from Yunnan and Upper Burma, with Descriptions of new Species.—By G. NEVILL, C. M. Z. S.*

The following is a list of the mollusca collected by Dr. Anderson on the two Yunnan Expeditions of 1868 and 1874, with descriptions of the new species and varieties; the greater part of the more remarkable novelties from the First Expedition have been already described by Mr. W. T. Blanford, in the P. Z. S. for 1869.

I prepared this list for Dr. Anderson's work on the zoology of Yunnan and Upper Burma about a year ago; since then several of my identifications have been noted by other writers. M. Morelet especially, in a most excellent account of the mollusca of "Indo-Chine," published as the 4th Livr. of the Ser. Conchil. in April 1875, with figures of the new and more important species, entirely confirms my views as to the probable identity of our common *Paludina Bengalensis* with species described from Sumatra, Siam, &c., as detailed further on; he records the occurrence in "Indo-Chine" of our Indian or Burmese *Helix capitium*, *Pythia plicata*, *Planorbis exustus*, *P. compressus* (which he identifies with *P. Tondanensis* from Java and *P. saigonensis*), *Cyclophorus fulguratus*, *C. Bensoni* (this identification I very much doubt), *Ampullaria globosa* and *A. conica*, *Paludina Bengalensis* with its variety *polygramma*, *P. ampulliformis* (= *P. lecythis* Bens., in my opinion doubtfully distinct from Gray's *P. Chinensis*), *P. præmorsa*, *Bithinia goniomphalus* (= *B. iravadica*), *Stenothyra monilifera*, *Melania Touranensis* (which he, no doubt correctly, believes to be only a variety of our *M. variabilis*), and *M. spinulosa*. He also anticipates in publication my views of the correct determination of the very difficult group of *Neritina* (*Dostia*) *violacea*: he unites into two species the three forms described and figured in this Journal for 1868 from Burma by Mr. W. T. Blanford, viz., *N. violacea*, Gm. (= *crepidularia*, Lam.) with *N. drepressa*, Bens., as a variety, and *N. cornucopia*, Bens., which he considers as specifically quite distinct, in which I decidedly agree with him, though we are both in opposition in this matter to the greatest living authority on the genus, Dr. E. von Martens, who, in his recent monograph of *Neritina*, for Kuster's Ed. Conch. Cabinet, unites all three forms into one.

The late Prof. Deshayes in Vol. X of the *Nouv. Archives du Muséum* (1876) gives a list of mollusca, collected lately in Cambodia by Dr. Jullien, in which many interesting forms, allied to our Indian genera, are fully described and figured; unfortunately, unlike M. Morelet, he entirely ignores the neighbouring Indian and Burmese regions and seeks for allied forms in South America. As well as I can judge without actual inspection

of his types, he describes varieties of our *Paludina Bengalensis* as *P. Chalangnensis* and *P. speciosa*, a variety of our *Melania variabilis* as *M. Julliceni*; his *Unio anceps* is wonderfully close to some upper Burmese varieties of *U. Bonneaudi* and should be compared with it; his *U. comptus* and *U. Crossei* also require comparison with Burmese forms; the former I fear may prove identical with my *Unio fragilis*; his *Paludina obscurata* is also found in Penang, and I believe it has been previously described.

A more accurate and ample report on the mollusca of the same region is published in the *Journal de Conchil.* for October 1876 by MM. Crosse and Fischer, in which the peculiar thick-shelled group of *Paludina Siamensis* is compared to that of the American sub-genus *Melantho*; I would call attention to the presence of a remarkable Bengal form of the same group, the *Paludina crassa* of Hutton, which has the singular habit of burying itself in closely packed groups of numerous individuals in the mud at all seasons, as accurately recorded in Hutton's excellent original description; our Cachar *Solenaria soleniformis*, Bens., so closely resembling South American species of *Mycetopus*, is also perhaps worthy of special remark in connection with MM. Crosse and Fischer's comparison of the *Unionidæ* of "Indo-Chine" with those of South America; I would also record here that a species of *Canidia* was lately discovered in the Rangoon river by Dr. Hungerford; it is the *C. Bocourti* of Brot (l. c., Pl. XII, fig. 6). M. Brot seems to have most thoroughly and undeniably fixed the proper systematic position of this interesting genus in the family *Buccinidæ*, instead of the *Melaniidæ*, where it had hitherto been classed.

I have given figures in the 'Report on the Zoology of Yunnan,' which Dr. Anderson is about to publish, of the following species described in this paper,—*Helicarion resplendens*, *Trochomorpha percompressa*, *Glessula fusiformis*, *Bithynia turrita*, *Margarya melanoides*, *Paludina heliciformis*, var., *Paludomus Burmanica*, *Unio fragilis*, *U. Andersoniana*, *U. Feddeni*, and two varieties of *U. Bonneaudi*.

#### TROCHOMORPHA PERCOMPRESSA, Blf.

*Helix (Sivella) percompressa*, Blf. P. Z. S. 1869, p. 448.

The single type specimen in the Museum collection, found on the First Expedition at Bhamô, remains unique.

#### NANINA (ROTULA) ARATA, Blf.

*Nanina (Rotula) arata*, Blf., P. Z. S. 1869, p. 448 (Bhamô).

*Helix arata*, Blf., Con. Indica, pl. 82, figs. 8—9.

Very closely allied to *N. anceps*, Gld., but may, I think, be fairly separated; the spire is considerably higher, and the base of the body-whorl more excavated round the umbilicus; the keel at the periphery is less acute

and the epidermis appears to be darker ; the sculpture is precisely similar ; the Museum possesses specimens of *N. anceps* from Tenasserim, also from Moulmein. Dr. Anderson found *N. arata* tolerably abundant at Bhamô and Ponsee ; the specimens from the latter locality are rather smaller and are the var. *minor* of Blanford.

NANINA (MACROCHLAMYS) RESPLENDENS, Phil.

*Helix resplendens*, Phil., Zeits. Mal. 1846 (Mergui).

This species was found abundantly at Bhamô and in the second defile of the Irawady. The specimens are quite undistinguishable from others in the Museum from Mergui (typical locality). I think it doubtful if Godwin-Austen's *N. atricolor* from the Shisha Valley will prove really distinct.

The figure in the Con. Indica, pl. 5, fig. 4, is not characteristic of the species ; it appears rather to represent *N. vitrinoides*.

NANINA (MACROCHLAMYS) HYPOLEUCA, Blf.

*Nanina (Macrochlamys) hypoleuca*, Blf., J. A. S. B. 1865 (Akoutong).

*Helix hypoleuca*, Blf., Con. Indica, pl. 64, figs. 6, 7.

A single specimen of this well-marked species was found at Bhamô ; there are also specimens in the Museum from Pegu, Arakan, and Mergui.

NANINA (DURGELLA) HONESTA, Gld., var. ANDERSONIANA.

*Helix honesta*, Gld., Pr. Bost. Soc. 1844 (Tavoy).

*Nanina honesta*, Gld. var., Stoliczka, J. A. S. B. 1871, pl. 17, figs. 7-9.

This species a good deal resembles an Assam form ; its thicker and more shining substance, less open perforation, less oblique peristome (which is considerably more broadly reflected, nearly covering the perforation), and its possessing a whorl less will, however, distinguish it. Typical *N. honesta*, as admirably figured in the Con. Indica, pl. 90, fig. 10, is found at Pegu, Moulmein, and Thyet-Myo ; var. *andersoniana* at Thyet-Myo, Sibságar, Naga and Khasi Hills, Chittagong, and East Cachar ; Dr. Anderson also found it at Ponsee, Ava, Nantin, and 2nd Defile (Irawady). This variety is distinguished by its less depressed shape, it is scarcely if at all angled at the periphery (the angulation being very distinct in type form), the peristome not quite so broadly reflected over the perforation ; the substance and texture, perforation, shape of the aperture, and number of whorls are identical.

Type of var. *andersoniana*, from Ponsee : axis  $6\frac{1}{4}$ , diam. 11 (apert. alt. 4, diam.  $5\frac{1}{2}$  mil.).

Specimen from Chittagong : axis 7, diam. 13 (apert. alt. 6, diam.  $6\frac{1}{2}$  mil.).

Specimen from Khasi Hills : axis 7, diam. 15 mil.

Typical *N. honesta*, from Pegu : axis 6, diam. 12 (apert. alt.  $5\frac{1}{2}$ , diam.  $6\frac{1}{2}$  mil.).

## NANINA (SITALA) ATTEGIA, Bens.

*Helix attegia*, Bens., A. & M. 1859 (Phic Than); Con. Indica, pl. 86, fig. 7.

This species was found at Prome and Bhamô; the museum also possesses specimens from Moulemein, Assam, and Preparis Island.

## NANINA DIPLODON, Bens.

*Helix diplodon*, Bens., A. & M. 1859, p. 187 (Teria Ghat); Con. Indica, pl. 60, fig. 8.

A few specimens were found at the 2nd Defile below Bhamô and also at Ponsee in Yunnan. The outer tooth of the aperture varies slightly in shape. This species seems to be allied to the *Sesara* group.

## NANINA (ROTULA) PANSA, Bens.

*Helix pansa*, Bens., A. & M. 1856, p. 252 (Akoutong); Con. Indica, pl. 56, fig. 1.

Found at Prome and also at Kalawat.

## NANINA (MICROCYSTIS) BARAKPORENSIS, Pfr.

*Helix Barakporensis*, Pfr., P. Z. S. 1852, p. 156 (Titalya, &c.); Con. Indica, pl. 87, fig. 7.

*Nanina (Kaliella) Barakporensis*, (Pfr.) Blf., J. A. S. B.

A single specimen only was found at Bhamô. The differences between the sub-genera *Kaliella* and *Microcystis* appear to be not yet sufficiently characterized.

## HELIX (PLECTOPYLIS) ANDERSONI, Blf.

*Helix (Plectopylis) Andersoni*, Blf., P. Z. S. 1869, p. 448; Con. Indica, pl. 112, fig. 8;

Godwin-Austen, P. Z. S. 1874, p. 612, pl. 74, fig. 9.

This remarkable form was not obtained on the Second Expedition; it was originally found at Hoetone and Bhamô.

## HELIX (PLECTOTROPIS) TAPEINA, Bens.

*Helix tapeina*, Bens., J. A. S. B. 1836, p. 352, (Sylhet).

The type specimens of Benson's *H. tapeina* are in the Indian Museum. Plate 15, fig. 6 of the Con. Indica well represents the form. It is distinguished from all other allied species by the less oblique columellar margin, rounded and not angular at the base (as are all its varieties); the keel at the periphery is acute. Typical *H. tapeina* is found abundantly at Cherra Punjee and in Assam.

## var. AKOUTONGENSIS, Theob.

*Helix akoutongensis*, Theob., J. A. S. B. 1859, p. 306; (not Con. Indica, pl. 15, fig. 4).

Only differs from the preceding by its more oblique columellar margin, more acutely keeled periphery, slightly more open umbilicus, and more depressed spire. I look upon this form as doubtfully separable from the next: the differences may be merely perhaps incidental to individuals, and not even to local races.

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Dr. Anderson found this variety in Upper Burma, where it was very common. There are also specimens in the Museum from Ava and Thyet-Myo.

Axis 5, diam. 15 mil.

var. ROTATORIA, Busch.

*Helix rotatoria*, v. d. Busch., Phil. Abb. 1842 (Java); Mouss., Moll. Java, pl. 2, fig. 8.

Only distinguished from the preceding variety by the less distinct or less excavated sutures, by the very acutely keeled periphery, and by the very white, more thickened, and less rounded margins of the aperture, showing within a distinct emargination at the periphery. Plate 15, fig. 5 of the Con. Indica is an excellent representation of this form; it only differs from the figures of Mousson and Philippi by its slightly more raised spire.

There are specimens in the Museum from Prome, Akoutong, Assam, and Khasi Hills; it was also found by Dr. Anderson at Manwyne and Shan Hills.

Specimen from Akoutong, axis 6, diam.  $15\frac{1}{2}$  mil.

var. BHAMOENSIS, nov.

Distinguished from typical *H. tapeina* by the last whorl, which is only slightly angular and not distinctly keeled; the aperture is smaller and less produced, with the columellar margin slightly oblique and angular at base; it is smoother and less depressed than var. *rotatoria*, with squarer aperture and without the acute keel at the periphery. The raised spire and angulate (not keeled) periphery agree with those of *H. phayrei*; it is, however, smoother, less openly umbilicated, with more contracted aperture and less developed sculpture than that species.

This variety connects *H. tapeina* almost insensibly with *H. catostoma*, Blf., and its varieties; the more raised spire, less open umbilicus, and more rounded and regular margins of the aperture, without any sign of being thickened or subdentiform at their base, are the best distinguishing characteristics.

Four typical specimens of this variety were found at Bhamô. Major Godwin-Austen has also presented some similar specimens from the Naga Hills. Plate 15, fig. 10 of the Con. Indica looks to me as much like this variety as it does the shell it is said to represent (that is, *H. Arakanensis*, Theob., J. A. S. B. 1864, p. 5), from which, however, it is easily distinguished by its more open umbilicus, less conically raised spire, and by the absence of the acute keel at the periphery, &c.

Type from Bhamô, axis  $6\frac{1}{2}$ , diam.  $12\frac{1}{2}$  mil.

## HELIX (PLECTOTROPIS) TRICHOTROPIS, Pfr.

*Helix trichotropis*, Pfr., Zeits. Mal. 1850 (China); Conch.-Cab., pl. 134, fig. 9-10.

This species differs from *H. tapeina* by the shape being a trifle more trochoid, the apex more central, and the whorls more concave; the keel at the periphery is even more developed, and the aperture a trifle more produced laterally; a marked characteristic is the minute and close spiral sculpture of the base, which in *H. tapeina* and all its varieties is on the other hand distinctly though minutely granulose; it is principally on account of this last character that I prefer to class *H. trichotropis* as a distinct species, and not as a variety of *H. tapeina* (near *rotatoria* and *akoutongensis*.)

Major Godwin-Austen found an extremely interesting form in the Khasi Hills, with more depressed spire and thinner texture (axis 6, diam. 18 mil.); it is, I believe, one of these specimens that is represented in the Con. Indica (pl. 15, fig. 4) as *H. akoutongensis*, from Pegu. A few specimens were found by Dr. Anderson at the Second Defile, Irawady; they agree exactly with specimens in the Museum from Shanghai.

Specimen from 2nd Defile, Irawady, axis 6, diam.  $15\frac{1}{2}$  mil.

## HELIX (PLECTOTROPIS) PEEPLANATA, n. sp.

(*H. trichotropis*, var. ♀)

Four specimens only of this very remarkable form were found at Mimboo, Upper Burma; a larger series is required to prove with certainty whether it be a distinct form, or only a variety of *H. trichotropis*, or of *H. tapeina* (near, var. *rotatoria*).

After a most careful examination with a lens, I am unable to trace any sculpture whatever on the base; the seven whorls above are perfectly flat, as in the European *H. explanata*; the keel on the periphery and the shape of the aperture are about the same as in *H. trichotropis* (especially the Khasi form); the umbilicus, however, is considerably more open, quite twice as open as in the Chinese and the above recorded specimens, and about half as open again as in those from the Khasi Hills; the epidermis seems peculiar, having the appearance of being less close in texture and of a decidedly more developed character.

Axis  $4\frac{1}{2}$ , diam.  $17\frac{1}{2}$  mil.

## HELIX (PLECTOTROPIS) OLDHAMI, Bens.

*Helix Oldhami*, Bens.—A. & M. 1859, ser. 3, vol. III, p. 184; Con. Indica, pl. 15, fig. 7.

This species, well represented in the Con. Indica, is next allied to *H. catostoma* and to *H. tapeina*; the characters of the aperture distinguish it

from the former, the very open umbilicus &c., from the latter. A single specimen was found at Ava, agreeing exactly with typical specimens from the Arakan Hills.

**HELIX (PLECTOTROPIS) CATOSTOMA, Blf.**

*Helix (Trachia) catostoma*, Blf., P. Z. S. 1869, p. 447 (Ponsee).

*H. catostoma*, Blf., Con. Indica, pl. 56, figs. 2, 3.

The specimen figured in the Con. Indica is not taken from a typical Yunnan specimen, but probably from one from Assam. The type in the Indian Museum, found at Ponsee on the First Expedition, is the only adult specimen as yet found in Yunnan; though, indeed, nine or ten immature specimens were also found, in none of which, however, are the characters of the lip developed. *H. catostoma* was found by Major Godwin-Austen and Mr. Robert tolerably abundantly in the Naga Hills, and it is probably one of these specimens that is figured as above in the Con. Indica; they only differ from the type form by the less depressed spire and slightly less open umbilicus; the characters of the aperture are the same, the dentiform process on the basal margin being equally developed and characteristic in both.

**HELIX (PLECTOTROPIS) HUTTONI, Pfr., var. SAVADIENSIS NOV.**

*Helix Huttoni*, Pfr., Symb. II. (Landour, &c.)

The shell represented in the Con. Indica, pl. 15, fig. 8, is not, I think, a typical specimen from the North-West Himalayas, but rather a specimen from Darjiling; the former is a smaller, more rounded, and less solid shell, scarcely keeled at the periphery, with a higher spire and less produced aperture. A form found by Dr. Anderson abundantly at Ponsee and Ava is nearer the Darjiling form; the spire is slightly higher, with the apex more central. Seven specimens of a distinct and remarkable variety were also found at Sawady; at first sight these present a curious resemblance to *H. arakanensis*, and with that species are probably the connecting link between *H. tapeina* and *H. huttoni*, though unmistakably only a variety of the latter; var. *savadiensis* differs by its more raised spire, stouter texture and less open umbilicus. *H. winteriana*, v. d. Busch. (Java) seems to be a var. of *H. huttoni*, differing by its more open umbilicus.

Specimen from Darjiling, axis  $5\frac{1}{4}$ , diam.  $12\frac{1}{4}$  mil.

Var. *savadiensis*, from Sawady, axis 7, diam.  $12\frac{1}{2}$  mil.

**HELIX (PLECTOTROPIS) PHAYREI, Theob.**

*Helix Phayrei*, Theob., J. A. S. B., 1859 (Ava); Con. Indica, pl. 1, fig. 15.

This is the largest species of the group, and is well figured in the Con. Indica; it appears to be rare, as three specimens from Ava are all there are in the Museum. It is next allied to typical *H. tapeina*, the umbilicus being exactly similar; the periphery, however, is merely angulate, not keeled;

the sculpture above is considerably coarser and more developed, the columellar margin more oblique and slightly angulate at base, and the outer margin more produced and rounded.

#### HELIX (TRACHIA) DELIBRATA, Bens.

*Helix delibrata*, Bens., J. A. S. B., 1836 (Sylhet).

*Helix procumbens*, Gld., Proc. Bost. Soc. 1844 (Tavoy).

The types of this species from Sylhet are in the Indian Museum. It is a form with an unusually open umbilicus, a single spiral brown band, and a rather flat spire. Major Godwin-Austen has also presented similar specimens from the Khasi Hills. A closely allied form is abundant in Arakan and Bassein; this only differs by the umbilicus being a trifle less open; it is well represented in the Con. Indica, pl. 14, fig. 10. Close to both the preceding are six specimens found by Dr. Anderson at Bhamô, umbilicus like that of the type form, suture a shade more excavated, slightly smaller in size. Var. *fasciata*, Godwin-Austen, J. A. S. B. 1875, pl. 1, fig. 1, is abundant at Sebsaugor in Assam; it only differs by its colouration. For the shell figured in the Con. Indica, pl. 14, fig. 9, I suggest the name of var. *khasiensis*; the raised and rounded whorls, less open umbilicus, and contracted aperture well distinguish the form; it has sometimes a single brown band, but is oftener without it; it is tolerably abundant in the Naga and Khasi Hills.

Type of *H. delibrata*, from Sylhet, axis  $7\frac{1}{2}$ , diam. 21 (apert. alt. 9, diam. 11 mil.).

Specimen from Bhamô, axis  $6\frac{1}{2}$ , diam. 19 mil.

Var. *khasiensis*, from Khasi Hills, axis  $8\frac{1}{2}$ , diam.  $19\frac{1}{2}$  (apert. alt. 9, diam.  $10\frac{1}{2}$  mil.).

Var. *fasciata*, G.-A., from Sebsaugor, axis 9, diam.  $23\frac{1}{4}$  mil.

#### HELIX (GANESELLA) CAPITIUM, Bens.

*Helix capitium*, Bens., A. & M. 1848, ser. 2, vol. ii, p. 160 (Behar);

*H. hariola*, Bens., A. & M., 1856, ser. 2, vol. xviii, p. 251 (Thayet Myo.)

There is no specimen in the Museum from Bengal of either of the shells called *H. capitium* or *H. hariola*, but I am informed by Mr. W. T. Blanford that he has in his collection specimens of typical *H. capitium*, from the Ganges Valley and from the Nullaymullay Hills in Southern India, and that he is convinced that the form in Upper Burma, first found by himself in 1861, cannot be distinguished. Morelet, Ser. Conch. IV, p. 254, 1875, records a most interesting locality for *H. capitium*, viz., Bangkok in Siam. On the other hand the Museum possesses both forms from Burma, from Prome the form figured in the Con. Indica, pl. 14, fig. 6, as *H. hariola*, and from Ava that figured on the same plate, fig. 5, as *H. capitium*; the latter Dr. Anderson also found at Kalawat in Upper Burma; the two forms

seem to me perfectly identical, except that var. *hariola* is keeled at the periphery.

HELIX (DORCASIA) SIMILARIS, Fér.

*Helix similaris*, Fér. Prodr., 1821.

Found abundantly at Prome, Pagan, Bhamô, and Sanda, with and without the brown band at the periphery; specimens agree exactly with others in the Museum from Penang, Shanghai, and Thyet-Myo; specimens from Mauritius, Bourbon, Seychelles, and Brazil differ slightly, but most certainly belong to one and the same species.

Axis max.  $9\frac{1}{2}$ , diam. max.  $16\frac{1}{2}$  (apert. alt.  $8\frac{1}{2}$ , diam.  $8\frac{1}{2}$  mil.).

HELIX (DORCASIA) BOLUS, Bens.

*Helix bolus*, Bens., A. & M., 1856 (Prome).

*H. tourannensis*, Soul., Voy. Bonite., Pl. 29, fig. 1-2 (Cochin China);

Con. Indica, pl. 23, fig. 7.

Dr. Anderson found this species very abundant at Pagan, Upper Burma, and at Pensee and Sanda in Yunnan; typical specimens from Prome are exactly similar; specimens of var. *tourannensis*, from Cochin China, only differ by the spire being slightly more raised.

HELIX (DORCASIA) ZOROASTER, Theob.

*Helix zoroaster*, Theob., J. A. S. B. 1856 (near Ava); Con. Indica, pl. 86, figs. 2, 3,

This species can be constantly distinguished from *H. similaris* by its larger and more depressed form, by the considerably more open umbilicus, the more angulate last whorl, and the more produced aperture, the columellar margin of which is much more oblique. It was found abundantly at Prome, Thyet-Myo, Pagan, Tsagain, and Manwyne.

Axis max.  $9\frac{1}{2}$ , diam. max.  $18\frac{1}{2}$  mil. (apert. alt. 9, diam. 10.)

HELIX (DORCASIA) SCALPTURITA, Bens.

*Helix scalpturita*, Bens., A. & M., 1859 (Ava); Con. Indica, pl. 53, fig. 9.

This fine species was found abundantly at Tsagain, Ava, Mandalay, and Second Defile, Irawady; it can be distinguished from both the preceding species by the rounded whorls and raised spire and by the height of the aperture; the brown band is almost always very distinct and richly coloured, in one or two specimens only is it obsolete. Though undoubtedly this and the two preceding forms are most closely connected, I consider all three at present as well-established species.

Axis. max. 13, diam. max.  $21\frac{1}{2}$  mil. (apert. alt. 11, diam.  $11\frac{3}{4}$ ).

PUPA (CYLINDREUS) INSULARIS, Ehr.

*Pupa insularis*, Ehr., Symb. Phy. (Red Sea); *P. pulla*, Gray, P. Z. S. (Banks of the Ganges). *P. cylindrica*, Hut., J. A. S. B. 1834; *Bulimus insularis*, Ehr., Con. Indica, Pl. 22, fig. 10.

This, probably our commonest Indian land-shell, was found in great abundance at Pagan, Upper Burma; very curiously neither this nor the next species are found at all in the neighbourhood of Calcutta. The Museum possesses specimens from Aden, Gwadar, Abyssinia, Sind, Kutch, Suliman Range, Trichinopoly, Ceylon, Poona, Burwani Hills, Tinali (Benares), and Saharunpur (N. W. Provinces). The Burmese localities of *P. insularis* and *P. cœnopictus* now recorded, I consider particularly important and interesting. Pl. 22, fig. 10 of the Con. Indica well represents the Burmese form.

PUPA (LEUCOCHILA) CÆNOPICTUS, Hutt.

*Pupa cœnopictus*, Hutt., J. A. S. B. 1834 (Agra).

*Bulimus cœnopictus*, Hutt., Con. Indica, pl. 23, fig. 9.

Found abundantly at Ava and Tsagain, Upper Burma; there are also specimens in the Museum from Erode, Cutch, Patna, Trichinopoly, Delhi, Quettan, Abyssinia, and Gwadar.

PUPA (SCOPELOPHILA) SALWINIANA, Theob.

*Pupa salwiniana*, Theob., J. A. S. B. 1870 (Shan States); Con. Indica, pl. 100, fig. 9.

I found a single specimen of this interesting shell inside a *Glossula obtusa* from Bhamô.

SUCCINEA ACUMINATA, Blf.

*Succinea acuminata*, Blf., P. Z. S., 1869, p. 449 (Ponsee); Con. Indica, pl. 68, fig. 7.

Found on the First Expedition only, at Momein in Yunnan; it is a well characterized and perfectly distinct species.

VERONICELLA, n. sp.

Two very fine specimens of an apparently quite new form were brought back from Ponsee, preserved in spirit; even in their present contracted state the bigger one is 93 mils. in length; I prefer not giving them a name at present, as I am not prepared to describe their anatomical characters.

VERONICELLA BIRMANICA, Theob.

*Vaginulus Birmanica*, Theob., J. A. S. B., 1864, p. 243 (Rangoon, &c.)

This species is not mentioned by M. Fischer, in his Monogr. of the genus, Nouv. Archiv, Vol. VII. Stoliczka gives further details concerning the form, J. A. S. B., 1871, p. 33. Dr. Anderson brought back eight specimens from Bhamô and Tonsine, preserved in spirit, of course; the largest measures 24 mils.

HELICARION RESPLENDENS, n. sp.

Shell in texture and colour resembling *Helic gigas*, Bens., but a little thinner and more membranaceous; it is at once distinguished from it

by its flattened, more ear-like and appressed shape. It also somewhat resembles *Helic. Peguensis*, Theob., J. A. S. B. 1834, p. 8, from Prome; it is, however, a larger and thicker shell, with the whorls of the spire much broader and more distinct, and considerably less open at the base; in many respects it is intermediate between the above two species, though all three are easily recognisable and quite distinct.

Type of *Helic. resplendens*, diam. max. 22, lat. 14, crass. 8 mil.

*Helic. gigas*, (small specimen), diam. 22, lat. 16, crass. 10 mil.

*Helic. Peguensis*, diam. 17, lat. 10, crass. 5 mil. (a rather larger specimen than the type).

Four specimens of this interesting form were found at Sawady. Dr. Anderson also brought back a single specimen (in spirit) from Bhamô (5000 ft.) which clearly shows the animal to be of a light pinkish colour, very sparsely dotted with black specks, except on the mantle lobes and caudal extremity, which are thickly dotted; in this specimen the spire of the shell only is covered by the animal, though the mantle lobe has no doubt shrunk.

#### HELICARION GIGAS, Bens., var.

*Vitrina gigas*, Bens., J. A. S. B., 1836, p. 350 (Sylhet).

A single specimen was found at Kyoukphoo; though differing slightly, it is so close to the shell of typical *Helic. gigas*, that I think there can be little doubt of their identity.

Diam.  $35\frac{1}{2}$ , axis  $8\frac{1}{2}$ ; apert. lat.  $27\frac{1}{2}$ , alt. 21 mil.

#### HELICARION MAGNIFICUS, n. sp., G. A. and NEV.,

I am indebted to Major Godwin-Austen for pointing out that this magnificent slug, the largest yet known of the genus, is quite distinct from Benson's *Helic. gigas* (Khasi Hills); Godwin-Austen has kindly undertaken to describe the animal with full details and a figure, so that it is only necessary for me here to state that it is very closely allied to the Assam species, but that the shell is much larger, of a brown (not green) colour, with the body-whorl much more flatly expanded, and the spire less convoluted and more depressed, and that, looked at from underneath, very much less of the reflected body-whorl is visible.

The largest specimen, in spirit, measures 70 mils.

Shell, diam. maj. 46, axis,  $11\frac{1}{2}$ ; apert. lat.  $40\frac{1}{2}$ , alt.  $29\frac{1}{2}$  mil.

Tolerably abundant at Momein in Yunnan, at 5,500 ft.

#### HELICARION VENUSTUM, Theob.

*Vitrina (?) venustum*, Theob., J. A. S. B. 1870, p. 400 (Arakan).

? *Helic. solidum*, G. A., P. Z. S., 1873 (Hengdan).

Dr. Anderson brought back, from Pensee in Yunnan, numerous specimens (preserved in spirit) of a small form, the shell of which I am unable

to distinguish from typical Arakan specimens of *Helic. venustum*, only differing in apparently being of a smoother and more polished texture and in the spire being a shade more distinctly convoluted; a single specimen of *Helic. solidum* from the Naga Hills is quite undistinguishable from the above Arakan specimens. The figures in the Con. Indica of the two forms are however so distinct that the types will have to be re-examined. Dr. Anderson also brought back a small specimen (in spirit) of apparently the same form from Nampura in the Kakhyen Hills, found under stones near running water; the animal of this specimen differs from that of my *Helic. resplendens* in apparently completely covering the shell and in being of a duskier, more uniform colouration, apparently not speckled at all, but of a darker tinge on the mantle lobes and caudal extremity than on the rest of the foot; this as far as it goes would seem to agree fairly with the original description of the animal of *Helic. solidum*, J. A. S. B. 1875.

#### HELICARION (CRYPTOSOMA) PRÆSTANS, Gld.

*Vitrina præstans*, Gld., P. Bost. Soc. 1843, p. 100 (Tavoy); Con. Indica, pl. 65, figs. 5, 6.

The entire shell is covered with a thick and compact brown epidermis; the largest specimen in the Museum, from Tenasserim, measures, axis  $27\frac{1}{2}$  diam.  $31\frac{1}{4}$  mil. It is an extremely abundant species in Tenasserim, and also near Moulmein; Dr. Anderson found it abundant at Sawady and on the banks of the Irawady, Second Defile.

#### ENNEA (HUTTONELLA) BICOLOR, Hutt.

*Pupa bicolor*, Hutt., J. A. S. B., 1834 (Mirzapore); Con. Indica, pl. 100, figs. 4—6.

Fairly abundant at Bhamô. Both *E. mellita*, Gld., and *E. ceylonica*, Pfr., are undoubtedly merely varieties of this most widely dispersed shell.

#### STREPTAXIS THEOBALDI, Bens.

*Streptaxis Theobaldi*, Bens., A. & M. 1859 (Teria Ghat); Con. Indica, pl. 8, fig. 8.

A few specimens were found at Bhamô, agreeing exactly with the typical Khasi-hill form.

#### STENOGYRA (OPEAS) GRACILIS, Hutt.

*Bulinus gracilis*, Hutt., J. A. S. B. 1833 (Mirzapore); Con. Indica, pl. 23, fig. 4.

Found abundantly at Tsagain and Bhamô on the First Expedition.

#### GLESSULA OBTUSA, Blf.

*Achatina (Glessula) obtusa*, Blf. P. Z. S. 1869 (Bhamô); Con. Indica, pl. 36, fig. 6.

This fine shell was found only on the First Expedition at Bhamô.

## GLESSULA SUBFUSIFORMIS, Blf.

*Achatina (Glessula) subfusiformis*, Blf., P. Z. S. 1869, p. 449 (Ponsee).

The single type specimen in the Museum, found on the First Expedition at Ponsee in Yunnan, remains unique; the species cannot be confused with any other of our Indian forms.

## GLESSULA PYRAMIS, Bens.

*Achatina pyramis*, Bens., A. and M. 1860, ser. 3, vol. V, p. 463 (Teria Ghat); Con. Indica, pl. 18, fig. 6.

Several specimens were found at Ponsee in Yunnan which agree fairly with the typical Khasi form.

## GLESSULA BLANFORDIANA, n. sp.

Shell resembling that of *G. Peguensis*, Blf., but rather more slender and of thicker texture, easily distinguished by the acutely raised undulating, perpendicular, and longitudinal striation.

Long.           , diam.           mil.

Two specimens only from Ponsee in Yunnan.

## LIMNÆA ANDERSONIANA, n. sp.

Shell small, horny brown, imperforate, globose, spire short; whorls four to five, last whorl large, ovate; columella remarkably thick and reflected, straight, without any twist; aperture subovate, anteriorly rather wide.

This small species, well characterized by its remarkable columella, is unlike any Indian species; the figure that it most resembles in 'Küster's Monog.' is a var. of *L. peregra*, pl. 3, figs. 17, 18; there is no shell like it figured in the 'Conch. Iconica'; probably *L. andersoniana* will prove to be a common species throughout S. China.

The late Dr. Stoliczka has since collected a perfectly identical form at Yarkand, as well as a variety at Kashgar, the latter interesting as possessing a very small umbilicus; *L. andersoniana* appears to be next allied to *L. pervia*, Mart. (? = *L. Davidi*, Desh.) and will require further comparison with type specimens of the two latter.

Long. 10, diam.  $6\frac{1}{4}$ ; apert. long.  $7\frac{1}{2}$ , diam.  $3\frac{3}{4}$  mil.

Abundant at Sanda and Nantin in Yunnan, at 4000 feet.

## LIMNÆA YUNNANENSIS, n. sp.

Shell medium-sized, ovately oblong, imperforate, pale horn-colour, very fragile, spire acuminate; whorls three to four, last whorl remarkably small; columella very strongly twisted and much produced, aperture very elongate contracted anteriorly, broadly and beautifully regularly rounded at base.

This species is closely allied to the shell figured by H. Adams, 'P. Z. S.' for 1866, as *L. Swinhoei* from Formosa; it also resembles pl. 4, fig. 25b

in the 'Conch. Iconica,' but not fig. 25*a*, which belongs apparently to a distinct species; *L. yunnanensis* may eventually prove to be an extreme variety of *L. Swinhoei*, characterized by the smaller body-whorl, by the aperture being more contracted anteriorly and more rounded posteriorly, finally by the slightly more twisted columella. I have little doubt that *L. swinhoei* itself is only a synonym of *L. flava*, Phil., Zeits. Mal. 1851, p. 78. (I. Liew-kieu); certain it is that a shell sent me by M. Morelet, under the latter name from China, agrees exactly with Mr. Adams' figure in the 'P. Z. S.'; Sowerby in the 'Conch. Iconica,' in his usual careless and worthless style, records and figures a species as *L. flava*, Morl. ?

Long. 16, diam. 10; apert. long.  $11\frac{1}{2}$ , diam. 7 mil.

At Sanda in Yunnan.

LIMNÆA ACUMINATA, Lam., var. RUFESCENS, Gray.

*Limnæa rufescens*, Gray, Sowerby, Gen. Shells, pl. 7; Con. Indica, pl. 69, fig. 1.

A single specimen was found at Mandalay during the First Expedition.

LIMNÆA LUTEOLA, Lam., var.

*Limnæa luteola*, Lam., Anim. s. Vert., VI, pt. 2, p. 160; Con. Indica, pl. 70, figs. 5, 6.

Six specimens of a small variety were obtained at Mandalay with the preceding species.

PLANORBIS EXUSTUS, Desh.

*P. exustus*, Desh., Belanger, Voy. Ind. Orient., p. 417, pl. 1, figs. 11—13; Con. Indica, pl. 39, fig. 10.

Numerous specimens were obtained at Bhamô.

PLANORBIS COMPRESSUS ?, Hutt.

*Planorbis compressus*, Hutt., J. A. S. B., 1834, p. 91 (Mirzapore); Con. Indica, pl. 99, fig. 1.

Four specimens were obtained at Sanda in Yunnan.

CYCLOPHORUS SUBLEVIGATUS, Blf.

*Cyclophorus sublaevigatus*, Blf., P. Z. S. 1869, p. 446 (Bhamô); Con. Indica, pl. 34, fig. 7. *Cyclophorus eximius*, Con. Indica, pl. 33, fig. 1, (not *C. eximius*, Mouss.)

The Museum is indebted to Dr. Oldham for several fine specimens of a form of this handsome species collected in Assam by Mr. Masters; they agree exactly in every respect with the type form, having light yellow-coloured apertures, &c., only they are a trifle larger in size; it is probably one of these specimens which is figured in the 'Con. Indica,' pl. 33, figs.

1, 2 (Khasi Hills!); it differs widely from Mousson's Javan species, by the acutely angled periphery, by its much more open umbilicus, and by the broad basal band, &c. A large series of a fine variety of this species has also been presented to the Museum by Mr. S. E. Peal, from the Naga Hills; this variety is of a slightly less depressed form, the umbilicus a trifle less open, but its most marked characteristic is the more circular aperture, which is of a deep crimson colour; I suggest that this handsome form be known as *C. sublævigatus*, var. *Pealiana*, after its discoverer. *C. balteatus*, Bens., from Pegu, is an extremely closely allied species.

Type, from Upper Burma, axis 29, diam. 46 mil.

Large form from Assam, axis 31, diam. 57 mil.

Type of var. *Pealiana*, from the Naga Hills, axis 30, diam. 56 mil.

#### CYCLOPHORUS FULGURATUS, Pfr.

*Cyclophorus fulguratus*, Pfr., P. Z. S. 1852, p. 52; Con. Indica, pl. 3, fig. 3.

[Var.] *Cyclophorus patens*, Blf., J. A. S. B., 1862; Con. Indica, pl. 3, fig. 5.

This species was found in great abundance at Mimboo and Prome; *C. patens*, Blf., from Pegu I consider only a variety, distinguished by its rounder and more thickened whorls, and especially by the less open umbilicus; *C. fulguratus* is one of the commonest Burmese land-shells.

M. Morelet states (Ser. Conch. IV, p. 283), that it is also found in Siam.

#### CYCLOPHORUS ZEBRINUS, Bens., var.

*Cyclophorus zebrinus*, Bens.—J. A. S. B., 1836, p. 355 (Sylhet); Con. Indica, pl. 2, fig. 2.

Found in great abundance by Dr. Anderson at Bhamô, Hoetone, and Ponsee. It appears to be a variety of the common Khasi species, differing by its greater size and duller colouring.

#### SPIRACULUM ANDERSONI, Blf.

*Spiraculum Andersoni*, Blf., P. Z. S., 1869, p. 447 (Bhamô); Con. Indica, pl. 86, fig. 3.

The type specimens were found on the First Expedition at Bhamô, where the species was then very scarce; it was obtained again on the Second Expedition, living in tolerable abundance on the right bank of the Irawady, Second Defile, above the Great Cliff.

#### SPIRACULUM AVANUM, Blf.

*Spiraculum Avatum*, Blf. J. A. S. B., 1863, p. 319 (Ava); Con. Indica, pl. 134, figs. 7, 8.

A single specimen was found on the First Expedition at Bhamô, the species is quite distinct from *S. Andersoni*.

## PTEROCYCLUS INSIGNIS, Theob., var.

*Pterocyclos insignis*, Theob., J. A. S. B., 1865; Con. Indica, pl. 5, figs. 6, 7.

Three dead specimens only of this interesting form were found on the First Expedition on the Kakhyen Hills; the spire is a trifle more depressed than in typical specimens from the Shan States.

## PTEROCYCLUS FEDDENI, Blf.

*Pterocyclos Feddeni*, Blf., J. A. S. B., 1865, p. 93 (Thyet Myo); Con. Indica, pl. 134, fig. 1.

Tolerably abundant at Bhamô and above the great Cliff, Second Defile, Irawady.

## ALYCEUS AMPHORA, Bens.

*Algyæus amphora*, Bens., A. & M., 1856 (Moulmein, &c.); Con. Indica, pl. 91, figs. 2, 3.

A few small specimens of this widely distributed Burmese species were found at Bhamô.

## BITHYNIA GONIOMPHALUS, Morl.

*Bithynia goniomphalus*, Morl., Rev. Zool. 1866, and Ser. Conch. III, pl. XIII, fig. 4 (Cochin China).

*B. Irawadica*, Blf., P. Z. S. 1869; Con. Indica, pl. 27, fig. 10.

A comparison of the type specimens in the Museum of *B. Irawadica* with typical specimens of *B. goniomphalus* from Cochin China (received from M. Morelet), prove the two species to be perfectly identical. Specimens from Siam of *B. Siamensis*, Lea (also received from M. Morelet), are exceedingly closely allied, and may prove to be only a variety; they differ, however, by their smaller size, and by the last whorl being rounded and not angulate, as is the case in *B. goniomphalus*. This species was obtained abundantly by Dr. Anderson at Ava, Mandalay, and Kabyuet.

## BITHYNIA TURRITA, Blf.

*Fairbankia?* (*Bithynia turrata*, Blf., P. Z. S., 1869, p. 446 (Kyoutong).

This most distinct and interesting species was not found on the Second Expedition; the single type in the Indian Museum, therefore, remains unique. The species is, I think, a true *Bithynia*, certainly not a *Fairbankia*. It was found at Kyoutong in Upper Burma.

## BITHYNIA MORELETIANA, n. sp.

In shape resembling *B. lutea*, Gray, (Con. Indica, pl. 37, fig. 7); spire peculiarly short, apex very obtuse and flattened, always eroded, but not decollated; whorls  $3\frac{1}{2}$ , the last obliquely produced; always imperforate, both in very young and very old shells; margins of aperture entire, broad-

ly reflected, produced and angled at base, outer margin rounded; epidermis dark olive-green; under the lens a minute spiral sculpture can be detected. Young specimens invariably show a sort of varix, formed probably at a period when their growth is arrested by some cause; this varix becoming absorbed in adult specimens. Above 200 specimens were found at Yaylay-maw.

Long. max.  $8\frac{3}{4}$ , min.  $7\frac{1}{4}$ , diam. max. 6, min.  $7\frac{3}{4}$  mil; long. anfract. ult. 7; long. apert.  $5\frac{1}{4}$ , diam. 3 mil.

This species can easily be distinguished from the Indian *B. cerameopoma* and *B. lutea*: it is imperforate, has fewer whorls, a shorter and more obtuse spire, the columellar margin is less acutely angled at base, the epidermis green instead of brown.

#### MARGARYA, n. gen.

This remarkable shell is very difficult to classify, owing to its great analogy to two fresh-water genera, *Paludina* and *Melania*. I think, however, there is little doubt but that it will have eventually to rank as a subgenus of *Paludina*. *Margarya*, so named in honour of its discoverer, who unfortunately shortly after was murdered near Momein by the Chinese, is characterized by its produced, melania-like spire, composed of scalariform, rapidly increasing whorls, with very distinct suture; apex obtuse; sculptured with prominent spiral ribs; rimate (or umbilicate?); margins of aperture rounded, not continuous; animal and operculum unknown.

#### MARGARYA MELANIODES, n. sp.

Shell large, spire produced, melania-like, with very deeply excavated suture, apex obtuse; whorls six, convex, the first two flat and obtuse, the third large and tumid (bigger in proportion than the fourth); the four last whorls are girt with three nearly equally distant, raised, irregularly nodulose keels, the middle one much the largest, having its nodules more developed and of a more or less compressedly transverse shape; umbilicus very small, almost entirely covered by the reflected columella; aperture almost circular, nearly as broad as high; columella short, evenly rounded, moderately reflected over the shallow umbilicus; a slight callous between the columella and outer lip; remains of an epidermis distinctly traceable.

A broken specimen of four whorls only, long. 67, diam. 47; anfract. ult. 44; apert. alt.  $28\frac{1}{2}$ , lat.  $27\frac{1}{2}$  mil.

A perfect, but not quite adult, specimen (6 whorls), long. 52, diam. 34; anfract. ult.  $35\frac{1}{2}$ ; apert. alt. 23 mil.

Four dead and water-worn specimens of this exceedingly interesting new form were picked up on the shores of Lake Tali in Yunnan by the late Mr. Margary and were given by him to Dr. Anderson, who has expressed

his desire that the form should be named in honour of the unfortunate discoverer.

PALUDINA CHINENSIS, Gray, var. AMPULLIFORMIS, Sow.

*Paludina Chinensis*, Gray, Griff. An. K. 1834 (China).

*P. lecythis*, Bens., J. A. S. B., 1836 (Sylhet).

*P. lecythoides*, Bens., A. & M., 1842 (Chusan).

*P. ampulliformis*, Soul., Voy. Bonite, 1852, pl. 31, fig. 25—27 (Cochin China).

*P. lecythis*, Bens., var. *ampulliformis*, Eyd. and Soul., Con. Indica, pl. 77, fig. 7 (Upper Burma).

The types of Benson's *P. lecythis* are in this Museum; they are a very large, globose, and thin form of *P. chinensis*; pl. 76, fig. 6, in the 'Con. Indica' fairly represents Benson's form; this variety has been recently rediscovered in India by Major Godwin-Austen, who found it at Manipur; Benson's types of *P. lecythis* were more probably found in the same locality, than in Sylhet proper.

Found in great abundance, about 5000 ft. above the sea, at Nantin, Mungla, Momein, and Hotha in Yunnan; there are two forms existing everywhere together which pass by insensible gradations the one into the other: one is a short tumid variety like typical *P. lecythis*, but of stouter texture and with the whorls much more distinctly angulate, appearing to me to be the form called *P. ampulliformis* by Souleyet: the other has a more produced spire, resembling that of *P. lecythoides*; apparently both Yunnan forms can be distinguished from Chinese specimens by the markedly shorter last whorl, some one or two, however, show in this respect so close an approach to var. *lecythoides* that I am afraid the character cannot be relied upon to separate *P. chinensis* and its var. *lecythoides* from var. *lecythis* and var. *ampulliformis*.

PALUDINA DISSIMILIS, Müll., var. DECUSSATULA, Blf.

*P. dissimilis*, var. *decussatula* (vel *P. decussatula*), Blf., P. Z. S. 1869, p. 445, (Ava).

Differs from *P. heliciformis*, v. Fr. by the less rounded whorls, by the more produced and not decollated spire, and by the less distinct angulation at the periphery, which is distinctly banded with a white belt, obsolete in the Pegu form. Both differ from typical Bengal *P. dissimilis* (*P. praemorsa*, Bens.) by the considerably more developed sculpture, more angular last whorl, less rounded aperture, and less open umbilicus, and by the more uniform green colouration; the white belt is also less distinct than it is in most Bengal specimens; it is even less like the South Indian var. *variata* and var. *obtusa*.

Common at Ava and Bhamô.

var. VIRIDIS, Rv.

*P. viridis*, Hanl. MSS., Rv., Con. Icon., fig. 20 [Loc. ?].

A fine striking form, easily distinguishable from the preceding by the more produced spire, obsolete belt, &c., exactly resembling the above figure

of Reeve, but a trifle smaller. A few specimens only were found at Ka-byuet.

Long.  $29\frac{1}{2}$ , diam. 21 mil.

PALUDINA SIAMENSIS, v. Fr., var. ?

*Vivipara Siamensis*, v. Fr., Zool.-bot. Ges., Wien, 1865, pl. 22, (Siam).

The Museum possesses a single typical specimen from Siam, which seems to present no distinctive characters, except in its greater size, from the numerous, but all unfortunately young, specimens found alive at the Second Defile of the Irawady and at Yaylaymaw.

PALUDINA BENGALENSIS, Lam., var. DOLIARIS, Gld.

*Paludina bengalensis*, Lam., var. *digona*, Blf., P. Z. S., 1869, (Bhamô.)

*P. doliaris*, Gld., Proc. Bost. Soc., vol. I. p. 144.

Countless varieties of this well known shell are to be found everywhere throughout the Indian region. The form from Bhamô, called var. *digona* by Mr. Blanford, the type of which is in the Museum, is very incorrectly figured in the 'Con. Indica,' pl. 115, fig. 7, the characteristic angulation of the last whorl not being shown; it is apparently the widest spread variety of all; in the Museum are specimens almost undistinguishable from one another from Calcutta, Mandalay, and Siam (received from Morelet as "*P. lineolata*, Mouss.>"). A small and less angular form of var. *digona* was obtained at Myadong, having the last whorl more produced and separated. Another form sent me by M. Morelet from Cochin China as "*P. polygramma*, Mart.," is also found in Pegu and Calcutta. An interesting form near var. *digona* was found at Shuaygoomyo: it differs by the remarkably developed transverse sculpture, by the peculiar green of the epidermis, which has less of a yellow tinge, and by the umbilicus being more open than in any other specimens I have seen of this protean shell; this form is near *P. oxytropis*, Bens. (Con. Indica, pl. 76, fig. 5) from Muni-pûr, though the latter I consider a good and distinct species. Since the preceding was written, M. Morelet has suggested (Ser. Conch. IV, p. 306), that probably both *P. polygramma* and *P. lineolata* are merely varieties of *P. Bengalensis*; he states that both forms are found in Cochin China, and he identifies the two former for certain as merely varieties of *P. sumatrensis*, Dkr., Mal. Bl. 1852.

MELANIA (STRIATELLA) TUBERCULATA, Müll.

*Nerita tuberculata*, Müll., Hist. Verm., p. 191, (Coromandel).

Two forms of this very common and variable shell were found abundantly in the old channel of the Irawady at Myadong; the commoner of the two somewhat resembles pl. 74, fig. 1, of the 'Con. Indica,' but is more richly coloured, with the brown band at base remarkably broad and

distinct; the whorls are a little narrower and more produced, the transverse ridges very acute and prominent, the longitudinal ribs nearly, or altogether, obsolete on the last two or three whorls; the upper two or three whorls are, as usual, decollated.

Long. max.  $27\frac{1}{2}$ , diam. 9 mil.

The other form is shorter and more rounded, of a pale green, with scarcely any brown spots or markings and with the basal band nearly, or altogether, obsolete; the transverse ridges are irregular and less acute, the longitudinal ribs, on the contrary, strongly developed, becoming obsolete only below the middle of the last whorl; decollated like the preceding.

Long. max. 20, diam. 8 mil.

#### MELANIA (MELANOIDES) JUGICOSTIS, Bens.

*Melania jugicostis*, Bens. MS., Con. Indica, pl. 110, figs. 8, 9. (Tenasserim Rv.).

Unfortunately, only two specimens of this interesting species were brought back by Dr. Anderson; they were found at Myadoung with the preceding and following species. The species seems to me to belong rather to *Melanoides* than to *Plotia*; it certainly a good deal more resembles the Chinese *M. cancellata*, Bens., than *Plotia scabra*; in either case it is a very distinct and well characterized species, and is admirably figured in the 'Con. Indica.' Shell small, slightly decollated; whorls five, abruptly angular, smooth and shining, with a few rather distant, somewhat obsolete and irregular, transverse ridges on the lower half of the last whorl; longitudinally angularly ribbed, ribs very distant, thick and prominent, almost varicose, eight of them on the last whorl, disappearing towards the base; very pale green, with no markings except a subobsolete brown band at base.

Long. 12, diam. 6 mil. •

#### MELANIA (MELANOIDES) IRAVADICA, Blf.

*Melania iravadica*, Blf., P. Z. S., 1869; Con. Indica, pl. 71, fig. 1.

This seems to me to be the Upper Burmese form of a shell described by Gould as *M. baccata*, Proc. Bost. Soc., 1847. Mr. Theobald has presented a series to the Museum from the Upper Salween River, well figured in the 'Con. Indica,' pl. 75, figs. 3, 11 and by Brot in the 'Conch. Cabinet,' pl. 9, fig. 6; at first sight they seem to differ considerably from the form described as *M. iravadica*; there is scarcely, however, any real difference, except the larger size and more distinct sculpture of typical *M. baccata*, which has three rows of nodules, the upper one of which is altogether obsolete in *M. iravadica*; in one or two specimens, however, of the former this row is also obsolete. The type specimens of *M. iravadica* are in the Indian Museum.

Typical *M. baccata*, of three whorls only, long  $38\frac{1}{2}$ , diam. 20 mil.

*M. Iravadica*, from Yaylaymaw, of three whorls only, long. 30, diam. 17 mil.

At the latter locality the species was found in great abundance by Dr. Anderson on the Second Expedition, as it was also on the First Expedition at Bhanô and Manwyne; the small specimens, so well figured by M. Brot (Matér. Mél. iii, pl. 4, figs. 12—13) were from the latter locality; these specimens had been given in exchange by the Museum to the late Dr. Stoliczka, by whom they were sent to M. Landauer.

#### MELANIA (MELANOIDES) REEVEI, Brot.

*Melania (Melanoides) Reevei*, Brot, Matér. Mél. i., p. 46 and Conch. Cab., pl. 11 fig. 4.  
*M. balteata*, Rv., pl. 20, fig. 144 B (not of Phil.).

A rather young specimen of this very distinct species was well figured as above by Reeve; an adult specimen of the same species is figured in the 'Con. Indica,' pl. 72, fig. 3. It is a well characterized species, quite distinct from *M. variabilis*, *peguensis*, and *gloriosa*, and of these three it is nearest allied to the last. There are specimens in the Museum from Noungebzick in Pegu; it was also obtained plentifully at Mandalay on the First Expedition, and on the Second Expedition at Myadoung.

#### var. IMBRICATA, Hanl.

*Melania Reevei*, var., Brot., Conch. Cab., pl. 11, fig. 4 A.  
*Melania Reevei*, var. *imbricata*, Con. Indica, pl. 153, fig. 4.

About twelve specimens of this variety were obtained at Yaylaymaw. It can be easily distinguished from the type form by its more developed sculpture; it has the same characteristic regular transverse ridges below the suture (four or five in number), but in addition has throughout other interrupted transverse ridges, broader than those near the suture and wider apart; it has also numerous longitudinal ribs, possessing a tendency at times to become obsolete (varying much in this respect in individual specimens), these ribs commence at the termination of the sutural row of regular transverse ridges, and are generally distinct only on the last few whorls; the columella is stained a rich brown colour.

Var. *imbricata*, of nine whorls, long. 65, diam. 26 mil.

#### MELANIA (PLOTIA) SCABRA, Müll.

*Buccinum scabrum*, Müll., Hist. Verm., p. 136 (Coromandel); Con. Indica, pl. 73, figs. 1-4.  
*Melania scabra*, Müll.

A few specimens were found at Myadoung; they agree perfectly with Reeve's fig. 156 B (*M. spinulosa*, Lam.).

## PALUDOMUS ANDERSONIANA, n. sp.

Large and globose; spire produced and pointed; of a very striking greenish yellow colour, with four intense black bands on the last whorl, the one at the suture and the two near the base about the width of the broadest band on *P. ornata*; the second band from the suture twice this width, this latter, in all but very old specimens, is very distinctly visible within the aperture; whorls seven, the first two or three generally decollated, transversely superficially ridged, ridges more or less obsolete towards the centre of the upper whorls, one of them below the suture more prominent than the rest; columella pure white; the operculum constantly differs on its inner side from those of the other Burmese species by the remarkably raised and very rugose nucleolar portion and by the distinct, though minute, granular margin. Dr. Anderson obtained several hundred specimens in all stages of growth at Mandalay, Ava, Bhamô, Kabyuet, and Myadoung. One of the best distinguishing marks from its var. *Peguensis* is the great width within the aperture of the second brown band; the band nearest the base, on the other hand, is comparatively smaller; in *P. Peguensis* (even in young specimens) the two upper bands are altogether wanting, the third very narrow, the last broad and diffused over the basal portion of the columella. This is probably the *Paludomus* sp. of Theobald from the Shan States, J. A. S. B., 1865, p. 264.

Long. max. 29, diam. max. 22 mil.

## Var. PEGUENSIS (an sp. n.?)

*Paludomus regulata*, Bens., var., Con. Indica, pl. 108, fig. 6.

Differs from the preceding by the slightly more rugose sculpture, by its more decollated apex, by the less cylindrical whorls and less produced and pointed spire (more apparent in young specimens), by the columella being apparently invariably faintly stained with brown, by the almost entire apparent absence of colouration on the last whorl, especially in the absence of the second broad band within the aperture. Unfortunately, all the specimens have lost their opercula. The specimen figured in the 'Con. Indica' is a very old decollated one.

Type of variety from Pegu, long. 21, diam. 16 mil.

## PALUDOMUS ORNATA, Bens.

*Paludomus ornata*, Bens., A. & M., 1856, 498; Con. Indica, pl. 108, fig. 8.

Specimens of this very handsome species from Ava, Pegu, and Mandalay are in the Museum Collection; it is well characterized by its seven produced and solid whorls, acute and prominent spire; the Ava specimens are not decollated, though quite adult; those from the other two localities

have, however, all lost their first three or four whorls; both young and old shells are perfectly smooth, with the exception of a deeply incised spiral groove below the suture; the figure in the *Con. Indica*, pl. 108, fig. 8, is excellent; perhaps it scarcely shows sufficiently clearly the three broad spiral brown bands; from the peculiar thickness, even of young shells, these bands are, however, often scarcely visible; the operculum resembles that of *P. regulata*, Bens., only it is little flatter, both differ considerably from that of *P. Andersoniana*, being much smoother on their inner side.

Long. 24, diam. 16 mil.

#### PALUDOMUS REGULATA, Bens.

*Paludomus regulata*, Bens., A. & M., 1856, p. 496; *Con. Indica*, pl. 108, fig. 5.

This species was not obtained by Dr. Anderson; the Museum, however, possesses some hundred specimens from Prome and Thyet-Myo in Pegu; the specimens from the latter locality are typical ones from the collection of Mr. Theobald; the shell is admirably figured as above in the '*Con. Indica*'; the spiral, broad, flattened ridges throughout are very characteristic, as is also its slightly compressed, angular shape; the operculum differs from that of *P. Andersoniana*, by being more concave and less broad on its inner side, the nucleolar part is less raised and much more rugose, the broad polished margin (under the lens) is destitute of sculpture, instead of being minutely granular.

Long. max.  $24\frac{1}{2}$ , diam. 16 mil.

#### PALUDOMUS BURMANICA, n. sp.

Shell small, very thick, spire depressed, in shape closely resembling the European *Litorina obtusata*; only two whorls, the others decollated in both young and old specimens; smooth, with a few irregular striæ at suture; columella very thick, pure white; aperture somewhat compressed, as in typical *P. labiosa*, not globosely expanded as in *P. Blanfordiana*; in all the ten specimens found, only three instead of four bands, the upper one exceedingly broad, covering nearly half the last whorl, the middle one narrow, the basal one broad, but not diffused over any part of the columella, these bands are of the most intense black within the aperture, even in very old, thick specimens; epidermis unusually thick, dark olive-green, closely covered with regular raised pustules of a lighter colour.

Yaylaymaw and also Mandalay.

Long.  $14\frac{1}{2}$ , diam. 12 mil.

The operculum is like that of *P. regulata*, a shade darker in colour, nucleolar portion on the inner side a little more distinctly spirally rugose. The broad and richly coloured bands (only three in number), pure white columella, and peculiar epidermis are the principal distinguishing characters from typical Tenasserim *P. labiosa*; it is, I consider, quite distinct from *P. Blanfordiana*.

## PALUDOMUS BLANFORDIANA, n. sp.

*Paludomus labiosa*, Con. Indica, pl. 108, fig. 9, (not of Bens.) "Tongoop."

There are good many specimens in the Museum from Pegu and Ava, also from Gowhatty in Assam, agreeing exactly with the shell figured as above in the 'Con. Indica'; there are also seven typical specimens of *P. labiosa*, collected by Mr. Theobald in Tenasserim; these latter are a good deal smaller and less angularly globose than the Pegu species, their columella is more vividly stained with brown, the brown bands are less regular and distinct (showing in an especially marked way within the aperture), and finally both young and old specimens are truncated, which is apparently never the case with the former; the sculpture of both is the same, quite smooth, except for a few irregular spiral striæ below the suture; the typical specimens of *P. labiosa* are without opercula; those of *P. Blanfordiana* resemble opercula of *P. regulata*, though they are even less rugose, the spiral striæ of the nucleolar portion of the inner side being distinct and regular (seen through the lens).

*P. labiosa* from Tenasserim, long. max.  $12\frac{1}{2}$ , diam. 10;

*P. Blanfordiana*, type from Ava, long. max. 19, diam. 15 mil.;

*P. Blanfordiana*, var. from Assam, long. 20, diam. 15 mil.

This species resembles as closely *P. ornata* as it does typical Tenasserim *P. labiosa*; specimens from Assam differ in no respect from Burmese ones, except by the spire being a trifle more produced, this locality for the species is interesting, it appears to be very abundant there.

## AMPULLARIA THEOBALDI, Hanl.

*A. Theobaldi*, Blf., Con. Indica, pl. 115, fig. 2, (Loc. ?)

? *A. maura*, Rv., var., Con. Icon. fig. 57 (Loc. ?)

Unfortunately none of the 16 specimens collected by Dr. Anderson at Bhamô are quite full-grown, the outer lip in all of them being thin and sharp; in the depression of the spire they agree with Reeve's figure of *A. maura*, as well as the typical figure of *A. Theobaldi*; the umbilicus is open, agreeing exactly with the latter figure; the colouration and shape of the aperture are also the same; I think it very doubtful, however, if it can be separated as a distinct species from the common Assam form, from which it only seems to differ by its larger size, less produced spire, slightly more open umbilicus, and in the colouration being a shade more vivid; in the latter two respects, however, some few Assam specimens approximate most closely.

## UNIO MARGINALIS, Lam., var. SAVADIENSIS, nov.

*Unio marginalis*, Lam., Anim. s. Vert.; Con. Indica, pl. 9, fig. 6, (sp. juv.)

This variety is abundant at Sawady in the Thengleng stream, also at Bhamô and at Shuaygoomyo; four young specimens found at Myadoug

probably also belong to this form. The nearest figured variety is *obesa*, Hant., Con. Indica, pl. 44, fig. 7, from the Irawady; var. *savadiensis* is of a more ovate shape, of a slightly thinner texture, the naere is of a light salmon- or cream-colour, instead of the ordinary bluish white tinge characteristic of var. *obesa*, the difference of colour in the naere is constant both in young and old shells; the lateral teeth are more convex, the cardinal ones a little less strongly developed; young specimens of both varieties are prominently winged, as in var. *lamellatus*, pl. 44, fig. 7, of the Con. Indica; externally young specimens are of a gamboge-yellow colour, tinged with bright green on the wing.

Long. max. 113, lat. max. 68 mil.

var. **CORRIANUS**, Lea.

*Unio Corrianus*, Lea, Trans. Am. Phil. Soc. V., pl. 9, fig. 25;

*U. marginalis*, var. *Corriana*, Con. Indica, pl. 44, fig. 4.

Four magnificent specimens of this very marked variety were found at Yaylaymaw; the naere is of the most beautiful salmon-pink colour; the only difference from typical Bengal specimens is that the texture and teeth are thicker, and this is the case also with specimens from Pegu.

Long. 115, lat. 55 mil.

**UNIO FEDDENI**, Theob.

*Unio Feddeni*, Theob., J. A. S. B. 1873, pl. 17, fig. 3.

Tolerably abundant in paddy-swamps at Bhamô, also at Yaylaymaw. I feel quite sure that Mr. Theobald is wrong in recording this species as found in the Pempunga, Central India; typical specimens from Mr. Fedden are marked in the carefully kept collection of Mr. H. F. Blanford as from Burmah; the specimens found by Dr. Anderson in Upper Burmah confirm Mr. Blanford's record of the locality of the original type form, as opposed to that given by Mr. Theobald; Mr. Fedden collected in both localities.

**UNIO BURMANUS**, Blf.

*Unio Burmanus*, Blf., P. Z. S., 1869, p. 450 (Bhamô); Con. Indica, pl. 42, fig. 1.

This form was not found on the Second Yunnan Expedition. Full-grown shells are narrower and more produced, with the umbones much less prominent, and the rugose sculpture also less developed than is the case with *U. Bhamoensis*.

The types of *U. Burmanus* from Bhamô are in the Indian Museum.

## UNIO BHAMOENSIS, Theob.

*Unio Bhamoensis*, Theob., J. A. S. B., 1873, p. 207, pl. 17, fig. 1.

*Unio Mandalayensis*, Theob., J. A. S. B., 1873, p. 208, pl. 17, fig. 2.

Not uncommon at Myadoung and Yaylaymaw ; found also on the First Expedition at Mandalay, Bhamô, and Shienpagah. The two above forms can certainly not be separated, as indeed might have been surmised from Mr. Theobald's remarks in the original description, large series from one locality showing that both varieties run one into the other. The Pegu form mentioned in the original description of *U. Bhamoensis* differs a good deal more from both than the Bhamô from the Mandalay one ; it is a pity Mr. Theobald did not give this Prome variety a name, instead of the Bhamô one.

## UNIO FRAGILIS, n. sp.

? *Unio foliaceus*, Gld., Proc. Bost. Soc. ; Con. Indica, pl. 42, fig. 3.

? *U. Peguensis*, Anth., Am. J. Con., pl. 25, fig. 2.

Ten specimens from Yaylaymaw only differ from the Pegu form, in that the epidermis, except on the posterior angle, is quite smooth ; unfortunately they all seem young shells ; the two biggest are exceptionally tumid, in this respect differing from the others, as also from the Bhamô and Sheinpagah specimens ; in all of the above the nacre is less yellow-tinged towards the umbones, and the teeth thinner than in *U. foliaceus*. It is a form extremely close to, if not identical with, the *U. comptus*, Desh. (Nouv. Archives X, Pl. 6, fig. 3—4), stated by MM. Crosse and Fischer to be the *U. Sumatrensis* of Lea.

Type of *U. fragilis* from Yaylaymaw : long. 34, lat.  $17\frac{1}{2}$ , crass.  $11\frac{1}{4}$  mil.

Three specimens from Bhamô, all young : long. max. 43, lat. 24, crass. 13 mil.

Thirty specimens from Shienpagah, all young : long. max. 32, lat. 17, crass.  $9\frac{1}{4}$  mil.

Specimens of *U. foliaceus*, from Pegu, long. 58, lat. 22, crass. 17 mil.

## UNIO PUGIO, Bens.

*Unio pugio*, Bens., A. & M., 1862, p. 193 ; Con. Indica, pl. 10, fig. 7.

Abundant at Myadoung, Bhamô, and Yaylaymaw. Very young specimens are rugose anteriorly, especially near the umbones.

Long. 57, lat. 27, crass. 20 mil.

## UNIO BONNEAUDI, Eyd. &amp; Soul., var.

*Unio Bonneaudi*, Eyd. & Soul., Mag. de Zool., 1838, pl. ; Con. Indica, pl. 10, fig. 6, and pl. 46, figs. 5, 6.

Very abundant at Myadoug, Irawady Second Defile, Shuaygoomyo, Yaylaymaw, and Bhamô. It varies considerably in being more or less rugose in sculpture.

Long. max. 52, lat. max. 29, crass. 24 mil.

#### UNIO ANDERSONIANA, n. sp.

This species was found at Myadoug in tolerable abundance, together with *U. Bonneaudi* and several other species; two specimens were also obtained on the First Expedition at Shienpagah. It is next allied to *U. pachysoma*, Bens., and to some of the varieties of *U. cæruleus*, Lea. It is easily distinguished from *U. Bonneaudi* by its more irregular shape, thinner texture by the acute angulation, greater production posteriorly, and by the more developed sculpture; a constant character also is the pink colour of the nacre, which in *U. Bonneaudi* is bluish white, this is equally distinct and characteristic in young as in old specimens.

Type from Myadoug, long. 32, lat.  $15\frac{1}{2}$ , crass.  $11\frac{3}{4}$  mil.

Specimen of *U. Bonneaudi* from Myadoug, long. 31, lat. 18, crass. 13 mil.

#### CORBICULA LAMARCKIANA, Prime.

*Corbicula Lamarckiana*, Prime, Ann. Lyc. N. York, 1867 (Mt. Laos, Cambodia).

Specimens obtained at Hotha and Momein (5,500 feet) in Yunnan, and also at Mandalay, agree exactly with Prime's original figure. Major Godwin-Austen also found a small form of this well-marked species at Manipûr, in the Kuchai stream.

Long.  $28\frac{1}{2}$ , lat.  $20\frac{1}{2}$ , crass. 13 mil.

#### CORBICULA YUNNANENSIS, n. sp.

Medium-sized specimens from Yaylaymaw agree fairly with Prime's figure and description of *C. Linneana*, (Ann. Lyc. N. York, 1867, Cambodia), the principal difference being the less truncate anterior side. Shell large, thick, transverse, inequilateral, compressed, rather abruptly tumid towards the umbones; anteriorly moderately produced and rounded, posteriorly produced and truncate (exactly as in Prime's figure of *C. Linneana*); lateral teeth curved, the anterior a little more so than the posterior; no lunule; epidermis dark brown, striæ regular and close; interior violet, of a darker shade near the margin. This species is more inequilateral, more tumid near the umbones, and more regularly sulcated than *C. Mülleriana*, Prime (*loc. cit.*), from China, which, however, it also closely resembles.

Type from Manwyne in Yunnan (4,000 feet): long. 39, lat. 33 mil.

Yaylaymaw (all young): long.  $21\frac{1}{2}$ , lat. 17, crass.  $11\frac{1}{2}$  mil.

## CORBICULA ANDERSONIANA, n. sp.

Rather small, thin, subequilateral, transversely ovate, tumid; medium-sized specimens closely resemble in shape *C. inæquilateralis*, Prime, both sides are obtusely rounded, epidermis bright green, interior violet, paler near the margin. This species is quite distinct from the other Burmese and Indian ones, it is, however, exceedingly close to *C. tumida*, Desh., P. Z. S., 1854, from Borneo, as figured by Issel.

Type from Momein in Yunnan: long.  $20\frac{1}{2}$ , lat. 12 mil.

IV.—*Descriptions of three new Species of Birds of the Genera Pellorneum, Actinura, and Pomatorhinus; lately collected in the neighbourhood of Saddy, Assam, by MR. M. J. OGLE of the Topographical Survey.—By Major H. H. GODWIN-AUSTEN, F. R. G. S., F. Z. S., &c.*

(Received March 29;—Read April 4, 1877.)

## 1. PELLORNEUM PECTORALIS, n. sp.

*Desc.*—Head to nape dull dark chestnut; back, wings, and tail umber-brown, the last indistinctly barred and with narrow pale tips, the outer primaries edged paler. Lores and frontal feathers pale, tipped with pale black, extending as an obscure supercilium to the nape, where the feathers become broadly dingy white on their upper web, dark brown on the lower, those on the back of the neck are broadly black-centred. The ear-coverts are umber-brown, darker behind, forming a crescentic margin again bordered lighter. The chin is pure white for three-quarters of an inch; a dark gorget of broadly black-centred feathers then crosses the upper breast, the centering of the feathers becoming very large, oblong, and conspicuous on the elongate feathers of the sides of the neck, but paler and less defined on the flanks. From the gorget all beneath is pale rufescent ochre. The under tail-coverts are dark, bordered with white.

Legs pale ochre. Irides vermilion.

	Wing.	Tail.	Tarsus.	Bill at front.
♂	3·0"	3·0"	1·12"	0·70"
♀	3·0	3·0	1·0	0·63.

HAB.—Saddy, Assam (M. J. Ogle).

This species is nearest and closely allied to *Pellorneum Mandellii*, W. Blanford, described from Darjeeling, which is the same as Hodgson's *P. Nipalensis*, a MS. name never published. It is a larger bird as regards wing, and the legs are more robust. The principal difference lies in the far larger extent of the dark streaking on the sides of the neck: the dark centred feathers are longer and broader than in *P. Mandellii*, the black oblong spots